

ABSTRACT

Methods for producing buried tunnel junctions in surface-emitting semiconductor lasers and devices incorporating the buried tunnel junctions are disclosed. The laser comprises an active zone containing a pn-junction, surrounded by a first n-doped semi-conductor layer and at least one p-doped semi-conductor layer. In addition to a tunnel junction on the p-side of the active zone, the tunnel junction borders a second n-doped semi-conductor layer. For burying the tunnel junction, the layer provided for the tunnel junction is removed laterally in a first step using material-selective etching until the desired diameter is achieved and then heated in a second step in a suitable atmosphere until the etched region is sealed by mass transport from at least one of the semi-conductor layers bordering the tunnel junction. This enables surface-emitting laser diodes to be produced in high yields with stabilization of the lateral single-mode operation and high performance.